

<b>Notice of Allowability</b>	Application No.	Applicant(s)	
	10/806,681	SUGAWARA ET AL.	
	Examiner	Art Unit	
	Asok K. Sarkar	2891	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 3/27/2006.
2. ☒ The allowed claim(s) is/are 1,4-6,8,16 and 18-30.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br/>Paper No./Mail Date _____</li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____</li> </ol> |
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## DETAILED ACTION

### *Response to Amendment*

1. Applicant's explanation of the instant invention in pointing the difference with the cited prior art was found to be persuasive.

### *Allowable Subject Matter*

2. Claims 1, 4 – 6, 8, 16 and 18 – 30 are now allowed.
3. The following is an examiner's statement of reasons for allowance:  

Claims 1, 4, 5, 21 and 22 recite, inter alia, group-III nitride semiconductor stack, comprising a first group-III nitride layer, a graded low – temperature deposited layer formed on the group-III nitride layer and made of nitride in which group-III element composition is continuously changed and a second group-III nitride layer formed on the graded low – temperature deposited layer wherein the graded low – temperature deposited layer is continuous with the first and second group-III nitride layers in terms of composition and represented by a compositional formula  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  in which a composition ratio  $x$  increases from 0, becomes a maximum in the graded low – temperature deposited layer, decreases again and becomes 0 at an uppermost portion of the graded low – temperature deposited layer along a direction of growth of films on the first group-III nitride layer. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Claims 6, 23 and 24 recite, inter alia, group-III nitride semiconductor stack, comprising a first group-III nitride layer, a graded low – temperature deposited layer

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formed on the group-III nitride layer and made of nitride in which group-III element composition is continuously changed and a second group-III nitride layer formed on the graded low – temperature deposited layer wherein the number of the graded low – temperature deposited layers formed is more than 1 and the plurality of graded low – temperature deposited layers are first and second graded low – temperature deposited layers, the second graded low – temperature deposited layer being continuously placed directly on the first graded low – temperature deposited layer. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Claims 8, 25 and 26 recite, inter alia, group-III nitride semiconductor stack, comprising a first group-III nitride layer, a graded low – temperature deposited layer formed on the group-III nitride layer and made of nitride in which group-III element composition is continuously changed and a second group-III nitride layer formed on the graded low – temperature deposited layer wherein the number of the graded low – temperature deposited layers formed is more than 1 and the plurality of graded low – temperature deposited layers are first and second graded low – temperature deposited layers, the second graded low – temperature deposited layer being placed on a GaN layer grown at high temperature directly on the first graded low – temperature deposited layer, the GaN layer being any one of an n – type GaN layer and an undoped GaN layer. The art of record does not disclose or anticipate the above limitation in

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combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Claims 16, 18, 19 and 27 recite, inter alia, a group-III nitride semiconductor device, comprising an undoped group-III nitride layer, a graded low – temperature deposited layer which is formed on the undoped group-III nitride layer and in which group-III element composition is continuously changed, an n – type group-III nitride cladding layer formed on the graded low – temperature deposited layer, a group-III nitride MQW active layer formed on the n-type group-III nitride cladding layer, a p – type group-III nitride cladding layer formed on the MQW active layer and a p – type group-III nitride contact layer formed on the p – type group-III nitride cladding layer, wherein the undoped group-III nitride layer is a GaN layer, the graded low – temperature deposited layer is  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  in which a composition ratio  $x$  changes between 0 and 1 and the n – type group-III nitride cladding layer is a Si – doped GaN layer. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Claims 20 and 28 – 30 recite, inter alia, a group-III nitride semiconductor device, comprising an undoped group-III nitride layer, a graded low – temperature deposited layer which is formed on the undoped group-III nitride layer and in which group-III element composition is continuously changed, an n – type group-III nitride cladding layer formed on the graded low – temperature deposited layer, a group-III nitride MQW active layer formed on the n-type group-III nitride cladding layer, a p – type group-III

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nitride cladding layer formed on the MQW active layer and a p – type group-III nitride contact layer formed on the p – type group-III nitride cladding layer, wherein the number of graded low – temperature deposited layers formed is more than 1. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

### ***Conclusion***

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on 571 272 1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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6. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Asok Kumar Sarkar*

Asok K. Sarkar

April 17, 2006

Primary Examiner